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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,348	01/16/2004	John Miller	TJT-13602/16	7451
25006	7590	03/07/2006	EXAMINER	
GIFFORD, KRASS, GROH, SPRINKLE & CITKOWSKI, P.C PO BOX 7021 TROY, MI 48007-7021			VIJAYAKUMAR, KALLAMBELLA M	
			ART UNIT	PAPER NUMBER

1751

DATE MAILED: 03/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/759,348

Applicant(s)

MILLER ET AL.

Examiner

Kallambella Vijayakumar

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– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 11-24, 26 and 31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 26 and 31 is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/19/2005 has been entered.

Claims 1-9, 11-24, 26 and 31 are currently pending with the application.

Applicant's arguments filed 12/19/2005 have been fully considered that fail to overcome the rejections in the last office action mailed 09/09/2005 for the following reasons:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1, 3-4, 8, 11, 13-14 and 17-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Bito et al (US 6,593,030).

The prior art teaches a negative electrode comprising an amorphous or low crystalline intermetallic compound active material such as Ni₂Si, Ti₂Sn, NiCoSn <first active phase> and carbon black <second phase/ stabilizer>. The active material was made by mechanical alloying of the component materials, and had a grain size of at most 0.7 microns and an average particle size of 24 microns (Col-3, Ln 54 - Col-5,

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Line-5; Col-5, Ln 34-40; Col-6, Ln 33-41; Fig 1A-1B). The prior art teaches forming a negative electrode from a paste containing the low-crystalline solid solution/intermetallic <First Phase/active material>, nanophasic carbon black <Second Phase; Spacer> and PTFE in the ratio of 80:20:10 by wt dispersed in a petroleum solvent (Col-6, Ln 33-40), and the coated film meets the limitation of the multiphase composite in the claims. The carbon black is a nanophase material with a particle size of 0.3-120 nm as shown by Weth et al (J. Porous. Matl., 2001, 8(4), Pg 319-325; Abstract). With regard to the limitation of the "spaced apart regions----10-100nm", in the claims 1 and 21, the prior art composition, its method of making and its utility as electrode materials are identical to that claimed by the applicants and identical compositions have identical properties and characteristics.

With regard to Claims 8, 11, 13-14 and 23, the prior art teaches an electrode containing carbon black.

With regard to claims 17-20, the prior art teaches mechanical alloying of the components in a ball mill with stainless steel balls, and the examiner asserts that the composition produced by other grinding techniques will result in a composition with same characteristics. All the limitations of the instant claims are met.

The reference is anticipatory.

2. Claims 1-8 and 11-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Sato et al (US 6,544,687).

Sato et al teach a negative electrode comprising an low-crystalline solid solution/intermetallic with the composition satisfying the formula $\text{Li}_x\text{M}^1_y\text{M}^2_z$ wherein M^1 -Ti, Zr, Mn, Co, Ni, Cu and Fe, and M^2 -Si and/or Sn, $0 \leq x < 10$, $0.1 \leq y \leq 10$, and $z = 1$ (Abstract, Col-2, Ln 7-24; Col-5, Lines 26-56, Fig-3-4) <First Phase>. The prior art teaches forming a negative electrode from a paste containing the low-crystalline solid solution <First Phase/active material>, graphite or low-crystalline-carbon <Second Phase; Spacer> and PTFE in the ratio of 60:30:10 by wt in a petroleum solvent (Col-4, Ln 1-5; 47-54; Col-2, Ln 21-24; Fig-4), and the coated film meets the limitation of the multiphase composite in the claims. The carbon black is a nanophase material with a particle size of 0.3-120 nm as shown by Weth et al (J. Porous. Matl., 2001, 8(4), Pg 319-325; Abstract). With regard to the limitation of the "spaced apart regions----10-100nm", in the

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claims 1 and 21, the prior art composition, its method of making and utility as electrode materials are identical to those claimed by the applicants and identical compositions have identical properties and characteristics, and thus meet the limitations of claims 1-4 and 21-22.

With regard to Claims 5-7, the prior art teaches the Low-crystalline intermetallics with a crystal grain size of 0.05-0.13 microns <50-130nm> dispersed in carbon black, wherein prior art composition, the active phase matrix, its particle size and its method of making are identical to those claimed by the applicants and identical compositions have identical properties and characteristics (Col-2, Ln 19-20; Col-5, Ln 26-37; Ln 38-42, Fig-3-4) (Specification: Page-10).

With regard to Claims 8, 11-14 and 23, the prior art teaches an electrode containing carbon material such as graphite <crystalline>, acetylene black and low crystalline carbon material (Col-4, Ln 6-8).

With regard to claims 15-16, the prior art teaches Fe₂Sn electrode material (Col-3, Ln 46-64, Col-6, Table-1).

With regard to claims 17-20, the prior art teaches mechanical alloying of the components in a ball mill, and the examiner asserts that the composition produced by other grinding techniques will have the same characteristics. All the limitations of the instant claims are met.

The reference is anticipatory.

3. Claims 1-8 and 11-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato et al (WO 01/03210).

Sato et al (US 6,544,687) is being used as the exact English translation of Sato et al (WO 01/03210) in the present rejection.

Sato et al teach a negative electrode comprising an low-crystalline solid solution/intermetallic with the composition satisfying the formula $Li_xM^1_yM^2_z$ wherein M¹-Ti, Zr, Mn, Co, Ni, Cu and Fe, and M²-Si and/or Sn, 0≤x<10, 0.1≤y≤10, and z=1 (Abstract, Col-2, Ln 7-24; Col-5, Lines 26-56, Fig-3-4) <First Phase>. The prior art teaches forming a negative electrode from a paste containing the low-crystalline solid solution <First Phase/active material>, graphite or low-crystalline-carbon <Second Phase; Spacer> and PTFE in the ratio of 60:30:10 by wt in a petroleum solvent (Col-4, Ln 1-5; 47-54; Col-2, Ln 21-24; Fig-4), and the

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coated film meets the limitation of the multiphase composite in the claims. The carbon black is a nanophase material with a particle size of 0.3-120 nm as shown by Weth et al (J. Porous. Matl. 2001, 8(4), Pg 319-325; Abstract). With regard to the limitation of the "spaced apart regions----10-100nm", in the claims 1 and 21, the prior art composition, its method of making and utility as electrode materials are identical to those claimed by the applicants and identical compositions have identical properties and characteristics, and thus meet the limitations of claims 1-4 and 21-22.

With regard to Claims 5-7, the prior art teaches the Low-crystalline intermetallics with a crystal grain size of 0.05-0.13 microns <50-130nm> dispersed in carbon black, wherein prior art composition, the active phase matrix, its particle size and its method of making are identical to those claimed by the applicants and identical compositions have identical properties and characteristics (Col-2, Ln 19-20; Col-5, Ln 26-37; Ln 38-42, Fig-3-4) (Specification: Page-10).

With regard to Claims 8, 11-14 and 23, the prior art teaches an electrode containing carbon material such as graphite <crystalline>, acetylene black and low crystalline carbon material (Col-4, Ln 6-8).

With regard to claims 15-16, the prior art teaches Fe₂Sn electrode material (Col-3, Ln 46-64, Col-6, Table-1).

With regard to claims 17-20, the prior art teaches mechanical alloying of the components in a ball mill, and the examiner asserts that the composition produced by other grinding techniques will have the same characteristics. All the limitations of the instant claims are met.

The reference is anticipatory.

4. Claims 1, 3-5, 7-9, 11, 13 and 17-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Sato et al (US 6,824,921).

Sato et al teach a negative electrode active material for a non-aqueous electrolyte secondary battery comprising: at least one nitride of an element (A) selected from the group A consisting of Ce, Co, Cr, Fe, La, Mn, Mo, Nb, P, Sc, Sr, Ta, Ti, V, Y, Yb, Zr, B, Ca, Mg, Na and Zn; and at least one substance of an element (B) selected from the group B consisting of Ge, Sn, Pb and Bi; wherein the average crystal grain size of said nitride was 0.001 to 0.1 microns and the content of the nitrogen to be preferably 1% by wt or

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more. The prior art further discloses the electrode active material composition to be amorphous with the particle size to be about 0.7 microns (Col-3, Ln 50-67; Col-5, Ln 18-23, Ln 63-67; Col-6, Ln 17-36; Col-7, Ln 20-26; Col-8, Ln 62-67). In a specific example, the prior art further teaches making the active phase by nitriding Ti₂Sn in a ball mill forming TiN with a crystallite size of about 10 nm (Second Phase/Stabilizer) and Sn that is X-ray amorphous (First Active Phase) that meets the limitation of composite and size of the spacer in the claims 1 and 21, and domain in claims 5-7 (Col-4, Ln 49; Fig-3; Col-8, Table-1; Col-9, Ln 14-60). The prior art further teaches forming an electrode by applying a paste containing negative electrode material, a graphite conductive agent and a SBR rubber in the weight ratio of 70:20:10 that meets the limitation of claim-21.

With regard to claims 17-20, the prior art teaches mechanical alloying of the components in a ball mill, planetary mill, attritor mill and vibratory ball mill (Col-5, Ln 63-66) and the examiner asserts that the composition produced by other grinding techniques will have the same characteristics. All the limitations of the instant claims are met.

The reference is anticipatory.

The examiner suggests the phrase "intersperse" in lieu of 'disposed' in claim-1, line-5 for the better clarity of the claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US 6,824,921).

The disclosure on the composition of the electrode and its active material by Sato et al as set forth in rejection-4 under 35 USC 102(e) is herein incorporated.

The prior art is silent about the wt % of active material in the composition.

However, the prior art further teaches nitriding Ti_2Sn in a ball mill forming TiN with a crystallite size of about 10 nm (Second Phase/Stabilizer) and Sn that is X-ray amorphous <less than about 7 nm; US: 6,576,207; Claim-8>(First Active Phase) and the claimed wt% of the active phase content would be obvious as a ratio of 5:10 for the crystallite diameters of amorphous Sn and the crystalline nitride in the composition.

2. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bito et al (US 6,593,030).

The disclosure on the composition of the composite by Bito et al as set forth in rejection-1 under 35 USC 102(e) is herein incorporated.

The prior art is silent about the characteristics of nanophase domains per the claims.

However, the prior art teaches the electrode composition containing Low-crystalline intermetallics wherein active phase matrix of the prior art composition, its particle size and its method of making, and

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its ratio with carbon are similar to those claimed by the applicants and similar compositions are expected to possess similar properties and characteristics, and the instant claimed nanophase domains would be obvious in the electrode composition.

3. Claims 2, 12 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bito et al (US 6,593,030) in view of Sato et al (US 6,544,687).

The disclosure on the composition of the composite by Bito et al as set forth in rejection-1 under 35 USC 102(e) is herein incorporated.

The prior art fails to teach the use of graphite as conductive agent and/or the use of Fe₂Sn as the component of the electrode or their ratios per claim 2.

In the analogous art, Sato et al teach the use of graphite and carbon-black as conductive agents and the intermetallics such as Fe₂Sn and Ti₂Sn as electrode active materials (Col-1, Ln 20-21, Fig-4, Col-3, Ln 23-27; 47-53) and to vary the content of carbon from 5-50 parts by wt per 100 parts by weight of the active material in forming the batteries with the benefit of high voltage and high density.

It would be obvious to a person of ordinary skill in the art to combine the prior art teachings to substitute the conductive carbon black with graphite and/or substitute the intermetallic active material with Fe₂Sn as functional equivalents and/or optimize the ratio of the carbon and the intermetallic to benefit from improved density with reasonable expectation of success, because the prior art by Bito is concerned about improving high capacity of the battery.

Allowable Subject Matter

Claims 26 and 31 allowed.

The prior art record neither teaches nor fairly suggest making of a multiphase composite material by forming a first portion by first mechanical alloying, adding a second portions of components to the first component followed by a second mechanical alloying per the claim-26 or by adding a plurality of components including a third and fourth elements wherein third element displaces second element per the claim-31.

Response to Arguments

Applicants argue that the prior art Sato et al (US 6,544,687) and (WO 01/03210), teach solid solutions that are crystalline and not a composite (Response, Page-3). It is correct that the prior art teaches a solid solution and its mixture with carbon forming an electrode that meets the limitation of the multiphase composite, wherein the composite is defined as a mixture of components by Hawley's condensed Dictionary. The art material has lower degree crystallinity as seen by comparing its X-ray diffraction pattern with that reported by Turner et al (US 6,203,944, Fig-9), and the presence of such lower degree of crystallinity and/or crystallites in an amorphous phase are encompassed by the instant claims, because the applicants define the amorphous material to be "lacking long-range order, although amorphous materials may have short or intermediate range order or even contain, at times **crystalline inclusions**" (Specification: US 2004/0146734; Para 0017). Further, the X-ray for the applicant's inventive materials show some sharp diffraction patterns indicative of some degree of crystallinity (Fig-1-3). The X-ray peaks for Fe₂Sn show broadening with decreased intensity showing low-crystallinity or presence of few crystallites in the art active material (Fig-4 of US-687). Applicants further argue that Sn is infiltrated into bcc structure of Fe whereby it is crystalline (Page-4), and the examiner disagrees with this over the teachings of Bito et al (US 6,593,030) that teaches such a dissolution results in a low-crystalline or amorphous materials (Fig-1A, 1B, Col-3, Ln 54 to Col-4, Ln 4, Col-4, Ln 55-65; Col-5, Ln 2-5).

Applicants further argue that the prior art by Sato(US-921) teaches that the crystalline material having a mixture of components and does not demonstrate or suggest the material functioning as stabilizer phases. The examiner disagrees with this for the reasons given above and over the x-ray diffraction patterns of the art composition that show much broader peaks <low-crystallinity> than the sharp peaks reported by the applicants as shown in Fig-1-3 (US 2004/0146734).

For the reasons set forth above the instant compositions fail to patentably distinguish over the art compositions.

Applicants are suggested to call the examiner to discuss the issues in the rejections and to identify the patentable compositions.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kallambella Vijayakumar whose telephone number is 571-272-1324. The examiner can normally be reached on 8-5.30 Mon-Thu, 8-4.30 Alt Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas McGinty can be reached on 571-272-1029. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMV
March 03, 2006.


Mark Kopec
Primary Examiner